SURGEX®
energy intelligence

AXESS Ready

Hardware Installation Guide

Axess Ready Branch Circuit Surge Eliminator/Power Conditioner

USER MANUAL

SOFTWARE VERSION: 1.01.41
FIRMWARE VERSION: 1.01.06

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Table of Contents

I. INTRODUCTION 3

II. INSTALLATION 5

PHYSICAL 5

ETHERNET CONNECTION 5

AC POWER CONNECTIONS 5

III. LED INDICATORS 6

IV. REMOTE CONTROL CONNECTIONS 6

CONTROL INPUTS 6

EXTERNAL LED CONNECTIONS 7

AUXILIARY RELAY CONTACTS 7

V. INITIAL SETUP 8

DEVICE MANAGEMENT UTILITY (DMU) 8

SETTING THE IP ADDRESS 10

VI. WEB SERVER 11

PASSWORD 11

CONTROL AND STATUS PAGE 11

SETUP PAGES 12

DEVICE 12

NETWORK 13

AUTOPING 14

SCHEDULE 16

PASSWORDS 17

Table of Contents (continued)

VII. COMMAND LINE INTERFACE (CLI) PROTOCOL 18

PROMPTS 18
CONTROL COMMANDS 18
DEVICE COMMANDS 18
NETWORK COMMANDS 19
AUTOPING COMMANDS 20
USER COMMANDS 20
EVENT COMMANDS 21

VIII. DxP PROTOCOL 22

OVERVIEW 22
HELLO HANDSHAKE 22
DXP PACKET 23
COMMANDS 24
DESCRIPTORS 24
PAYLOADS 26

IX. FIRMWARE UPGRADES 27

X. RESET BUTTON 27

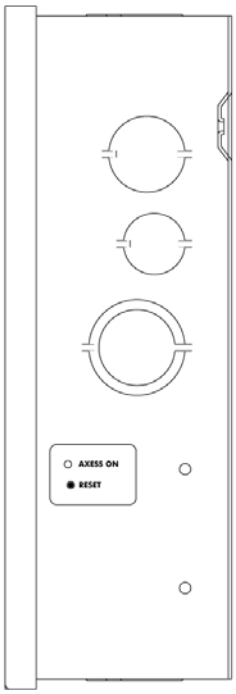
XI. SPECIFICATIONS 28

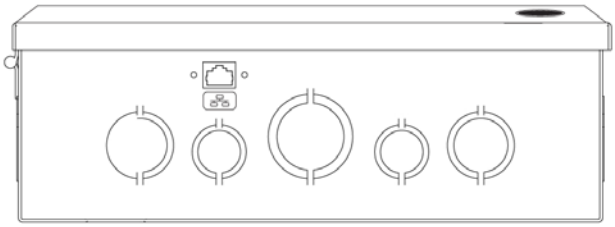
I. Introduction

The SurgeX® SX-20NE-RT-AR is a network attached, IP addressed, web controlled AC surge eliminator and power conditioner. The SX-20NE-RT-AR may be used to switch up to 20A at 120V. The simple web server structure allows basic control of one branch circuit. The extensive programming and setup capabilities are accessed by a web browser, through a Device Management Utility (DMU), or through a Command Line Interface (CLI).

- The SX-20NE-RT-AR features a magnetic shielding NEMA steel enclosure, SurgeX® Advanced Series Mode® surge elimination, Impedance Tolerant EMI/RFI filtering, SurgeX ICE® Inrush Current Elimination, and low level control inputs/outputs.
- Remote reboot any device: monitors, routers, servers, kiosks, etc. The remote device need not be network attached.
- Conserve energy by powering down equipment when not in use.
- Telnet access uses the Command Line Interface (CLI) structure and syntax to completely configure and control the SX-20NE-RT-AR. This Axess Ready (AR) device also supports the DxP protocol, which allows software developers to integrate the unit into custom applications.
- Up to 2 systems can be continuously monitored with AutoPing, with automatic power control upon loss of contact. Reboot crashed systems, or provide auto power-up or -down for environmental controls and notification systems.
- The SX-20NE-RT-AR utilizes 2 levels of password security, with only the administrative account having access to setup and configuration.
- Accepts both DC voltage and contact closure control inputs.
- Two or more units can be cascaded together for larger systems.
- Auxiliary relay output can be used to control other SurgeX® products.
- 12 Volt DC output can be used to control other SurgeX® products or drive LEDs.
- Auxiliary relay or 12 Volt DC output can be used to provide confirmation feedback.
- 12” x 12” x 4” NEMA enclosure meets electrical code for use at the service entrance, sub-panels, and in ceiling plenums.

I. Introduction (continued)





Located on the front panel are:

- Remote LED
- Self-Test LED

Located on the bottom is:

- Network connection (RJ-45)

Located on the right side are:

- Reset button
- Axess On LED

II. Installation

Physical

The SX-20NE-RT-AR is housed in a magnetic shielding NEMA enclosure designed to be installed at a service entrance, electrical sub-panel, or in a ceiling plenum. Input and Output AC connections are made through the enclosure knock-outs and are hard-wired to internal terminal blocks.

Ethernet Connection

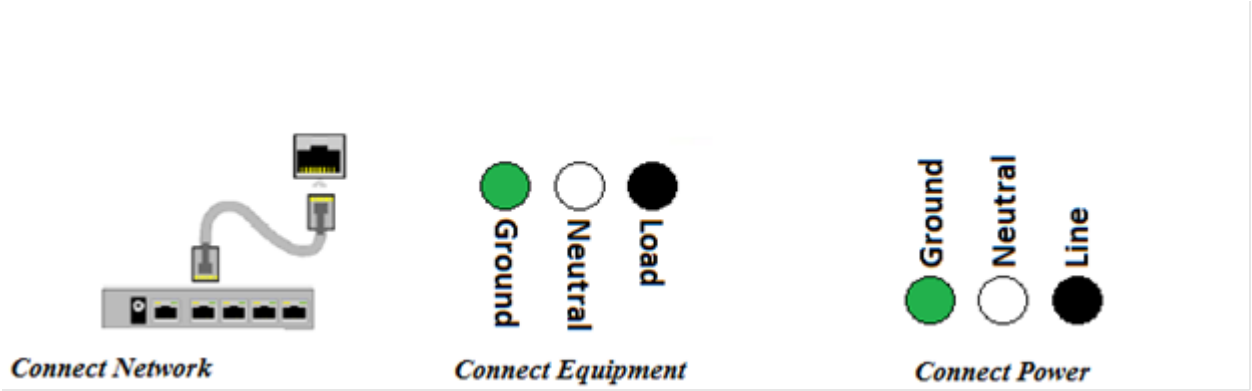
The RJ45 connector for 10/100 Ethernet is situated on the bottom of the unit. The default IP Address is 192.168.1.254.

AC Power Connections

Connect the wires to the equipment (load) to be powered On and Off to the lower terminal block labeled “Load”. Connect Black to **Load**, White to **Neutral**, and Ground to **Ground**. If the connected equipment has a Power switch, leave it in the On position to allow the SX-20NE-RT-AR to control the power.

Connect the wires from the electrical service (line) to the upper terminal block labeled “Line”. Connect Black to **Line**, White to **Neutral**, and Ground to **Ground**.

IMPORTANT: In order for the SurgeX circuitry to function properly, the unit must be installed exactly as stated above (the unit will not function without a Neutral connection).
The SurgeX SX-20NE-RT-AR product is rated at a load capacity of 20 Amps and shall be wired only by qualified Electricians using 12 Ga. conductors as specified in Article 310 of the 1999 National Electric Code, as set forth in Table 310-13. Any type of conductor suitable for use in wet or dry locations such as (but not limited to) THHN, THHW, THW, THWN, or TW shall be considered acceptable if local Code permits. The circuit to which the product is connected must be protected by a 20 Amp circuit breaker.



III. LED Indicators

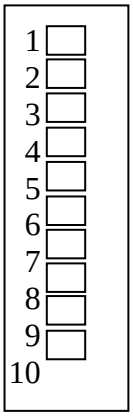
	AXESS ON	The Axess Ready system is On. The AR system must be on to enable hard-wired remote control connections.
	REMOTE	A hard-wired remote control signal is active and the output is On.
	SELF-TEST	The internal surge protection circuitry is fully functional.

IV. Remote Control Connections

Remote control connections are wired to the black 10-pin terminal block on the inside of the unit. The terminal block is shipped with a jumper wire between pins 1 & 2 so that the unit can be used without a remote control connection. If you will be using remote control you will first need to remove this jumper wire. Never solder (tin) wires before inserting into a terminal block – solder cold flows and you will eventually have loose connections!

CAUTION: Do not repeatedly turn the unit Off—On—Off—On with a heavy load connected. The ICE™ circuitry absorbs the inrush energy each time the unit is turned on and may overheat if this is done too many times in a short period of time. Wait one minute between repeated turn-ons.

The connections are shown below:



Pin 1 – Contact Closure
Pin 2 – Contact Closure
Pin 3 – Applied Voltage +
Pin 4 – Applied Voltage -
Pin 5 – Power LED +
Pin 6 – Power LED -
Pin 7 – Remote LED +
Pin 8 – Remote LED -
Pin 9 – Aux Relay Contact
Pin 10 – Aux Relay Contact

Control Inputs

The SX-20NE-RT-AR can be controlled by a DC voltage in the range of 5V to 30V, by a contact closure (such as a relay), by a switch (latching), or by another SurgeX product such as the SEQ. Switches with gold contacts are recommended for the best long-term reliability.

a) DC Voltage: The unit will power up when the voltage is present, and power down when there is no voltage. Connect the positive wire to Pin 3 (Applied Voltage +), and the negative wire to Pin 4 (Applied Voltage -). The positive and negative connections must be made with the correct polarity for proper operation.

b) Contact Closure/Latching Switch: The unit will power up when the contacts are closed, and power down when the contacts are open. Connect the two wires from the contacts or switch to Pin 1 (Contact Closure) and Pin 2 (Contact Closure).

Output control requires a combination of Axess Ready (AR) control via IP and Remote Turn-On/Off (RT) control via hard-wired connection. The following table will detail the LED and output states during various operating conditions.

Control State			**Output State**		
Axess Control	CC Input	DC Input	Axess LED	Remote LED	Out put
On	On	Off	On	On	On
On	Off	On	On	On	On
On	Off	Off	On	Off	Off
Off	Any	Any	Off	Off	Off

External LED Connections

The SX-20NE-RT-AR product is able to drive external LEDs or other signaling devices through its 12V DC LED outputs, which can provide up to 10mA of current each. External LEDs connected to the Power LED pins (5 and 6) will be illuminated when AC power is applied to the unit, and external LEDs connected to the Remote LED pins (7 and 8) will be On when the unit's AC output is On, and Off when the output is Off. When connecting LEDs to either output, a series resistor is required. For example, many LEDs work well with 10mA of current, so a 1KΩ resistor is usually a good choice. If more than one LED is required, then use a separate series resistor for each LED. For example, two external LEDs, each with a 2kΩ series resistor, could be powered from one unit at 5mA each.

Connect each LED anode to "LED +" through a resistor, and the cathodes to "LED -".

Auxiliary Relay Contacts

The auxiliary relay contacts, Pins 9 & 10, provide a way to cascade units or to provide confirmation feedback to a central controller. When the output is On, the aux relay contacts are closed. There is a ½ second delay before the aux relay closes, which allows time for the SurgeX Inrush Current Elimination (ICE™) circuit to operate. This short delay in combination with the SurgeX ICE™ makes it unnecessary to sequence the power to several large loads (such as amplifiers) because of inrush current. SurgeX SX-20NE-RT-AR products, when cascaded, can turn on a bank of large amplifiers with no inrush current, and therefore no risk of tripping a circuit breaker.

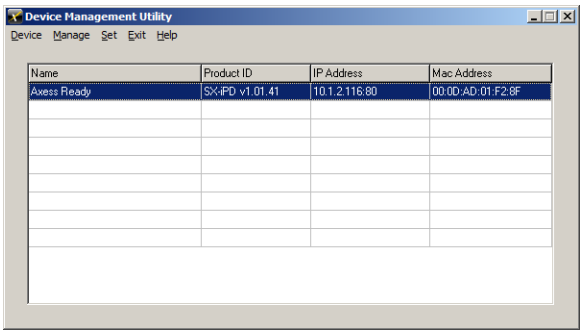
To cascade two or more SX-20NE-RT-AR products, connect the aux relay contacts of one unit to the contact closure input of the next unit. To provide confirmation feedback, connect the aux relay contacts to an input on the central controller. The relay contacts are rated for 1 amp at 30 V DC.

V. Initial Set-Up

Device Management Utility (DMU)

The SurgeX Device Management Utility (DMU) provides the easiest means to find and configure your AR for use. The DMU can:

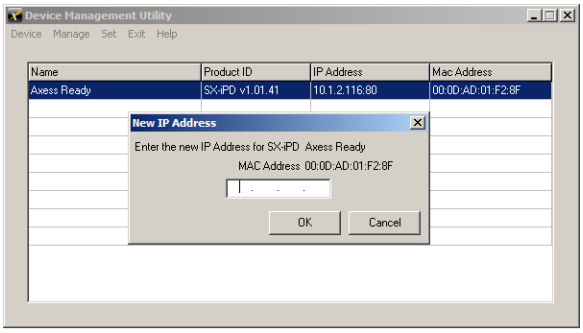
1. Automatically discover multiple ARs on a local network.
2. Display the current IP address of each AR.
3. Allow the setting of a new IP address for each AR.
4. Perform firmware upgrades.
5. Return an AR to Factory Defaults.



DMU automatically discovers devices on the local network.

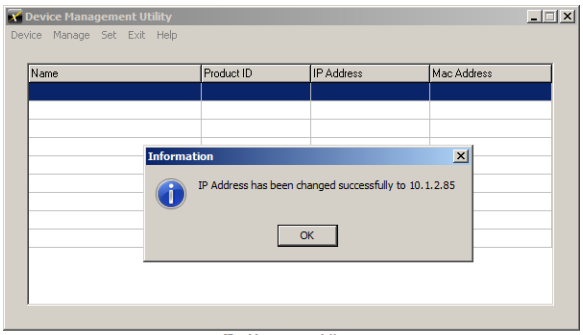
The SurgeX Device Management Utility is available on the AR CD or on the SurgeX website at **http://www.surgex.com**

Note: The IP address can only be set within the first 2 minutes after powering up the AR. The utility will only work with ARs on the same local subnet as the PC.



Enter new IP address for selected Axess Ready.

Device



IP address successfully set.

Discover: Automatically discover all ARs on the local network. The DMU will display the location name of the AR, the product ID and version number, the current IP address, and the MAC address. Factory defaulted ARs will display with the name **New SX-iPD** and have either the factory default IP address of **192.168.1.254** or an IP address that was automatically assigned by the DHCP server on your network. If the IP address was assigned by a DHCP server, no changes to the IP address are required.

The IP address field also indicates the port for web access that is currently in use by the AR. The standard port for web browser accessibility is factory default Port 80.

Add: Manually add an AR by IP address.

Clear: Clear the list.

V. Initial Set-Up (continued)

Manage

Open Browser: Opens the web browser interface for the selected AR.

Upgrade Firmware: Starts the Firmware Upgrade dialogue.

Firmware Upgrade requirements:
Valid firmware file.
Administrative login credentials.
"Upgrade Enable" must be set to yes, set via web page or CLI.

Set

IP Address: Changes the IP address of the selected AR.

Factory Defaults: Return the selected AR to a Factory Default state. This action must be performed within the first 2 minutes after powering up the unit.

Local Address: Select the IP address to Discover on. This may be necessary for computers with multiple network connections.

Exit

Exits the DMU program.

Help

Online Help: Opens a web browser to online help resources.

About: Displays DMU version information.

Setting the IP Address

ARs are configured with a factory default IP address of **192.168.1.254**.

To set the AR's IP address using one of the following methods, the computer and AR must be on the same local network.

DMU: Follow the steps in the preceding subsection to set the IP address using the Device Management Utility (DMU).

CLI: These are the basic commands to set the network parameters. After setting these parameters, the AR will need to be rebooted for the settings to take effect. Any command that requires rebooting of the AR will provide a prompt to do so. All commands may be entered as required before rebooting. Manually specifying the IP address via CLI automatically sets the address as static.

Example: Telnet to default IP address of **192.168.1.254** on default Port **23**:

```
SurgeX Axess Ready v1.01.41
User> admin
Password> *****

Axess Ready> set ipaddress 10.1.2.69

Ok
Axess Ready Reboot Required> set subnet 255.255.255.0

Ok
Axess Ready Reboot Required> set gateway 10.1.2.1

Ok
Axess Ready Reboot Required> reboot
```

The CLI command **set ipmode dhcp** followed by a **reboot** command may be used to configure the AR to automatically acquire its network settings from a DHCP server. A DHCP server will automatically assign an IP address (dynamic address), as well as the Subnet Mask and Gateway.

To determine what IP address has been automatically assigned by the DHCP server, you will need to use the Discover feature of the DMU or query your DHCP server and locate the MAC address of the AR in the DHCP server's IP/MAC table.

Web: To set the IP address using a web browser, navigate to the current IP address of the AR (**192.168.1.254** if the unit is in a factory default state). Enter the administrator credentials (Factory Default User: **admin**, Password: **admin**), click on "Setup", then click on "Network" and follow the directions in the Web Server/Network/Setup section of this manual.

VI. Web Server

The Axess Ready web interface provides the easiest means of operating the outlet and changing configuration parameters.

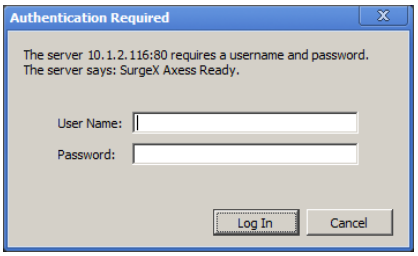
To access the web interface, open a web browser and enter the IP address of the AR into the address bar. The factory default IP address is **192.168.1.254**.

Password

The AR uses two username/password credential sets, one for normal power control (user) and one that also provides access to the Setup functions (admin).

Default credentials:

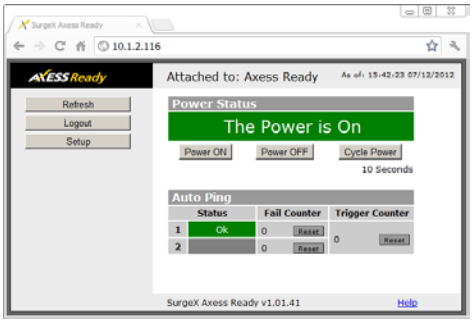
Role	Username (fixed)	Password (user set)
Administrator	admin	admin
User	user	user



Enter a valid username and password when prompted. When the proper username/password combination is received, the Control and Status Page is displayed.

Control and Status Page

Once a user is validated, the Control and Status page is displayed.
Note: Only one user may be logged in to the AR at a time.



Press “Power On” or “Power Off” to turn the AC output On or Off. In the event of a power outage, the AC output will return to its last known state prior to the outage.

Press “Cycle Power” to temporarily change the state of the AC output for a specified cycle time (factory default is 10 seconds). The cycle operation performed will either be On-Off-On or Off-On-Off, depending on the initial state of the AC output. During the power cycle operation, the Power Status bar will indicate the temporary status with a Blue background. Once the cycle is complete, the status bar will revert to its original condition. To abort a power cycle, press either “Power On” or “Power Off” and the outlets will assume that status.

If the AutoPing feature is in use, this page will also display the current status (OK or Failed) for each AutoPing, a counter of how many times the ping failed, and a counter of how many times the defined action was triggered. Reset buttons for the Fail and Trigger counters are available for the admin login.

Use the Refresh button to update the page with the most current status. Use of the browser’s refresh button may lead to inadvertent power switching. If an NTP time server is being used, the time of the last refresh will be displayed in the upper right corner.

Setup Pages

Setup pages are only available while logged in with Administrator credentials. Press Save to save the new settings. If the new settings require the AR to be rebooted, a Reboot button will appear at the bottom of the page. Settings requiring reboot will not take effect until the unit is rebooted.

Device

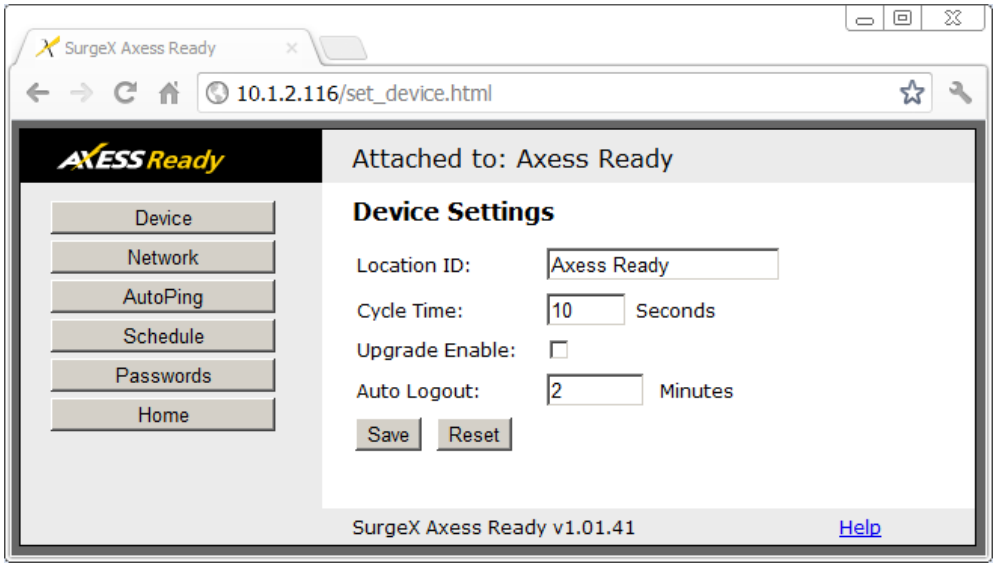
Location ID: Specifies a name label (up to 20 characters) that will be displayed at the top of all pages. Assigning unique names is helpful for management of multiple units.

Cycle Time: Specifies the length in seconds of a power cycle (1-999 seconds). This is the amount of time the outlet will temporarily be On or Off, depending on the initial outlet state.

Upgrade Enable: Enables the ability to upgrade the firmware of the AR.

Auto Logout: Specifies the inactivity timer duration in minutes (0-99 minutes). If there is no activity after the specified amount of time, the user will be automatically logged out. Setting the timer duration to 0 disables the timeout feature.

Important: As the AR allows only one web user logged in at any time, use caution when disabling the timeout feature, as it is possible to lock out other users by forgetting to log out. Closing the web browser will not log the user out, and will lock out web access. In this situation it will be necessary to access the AR via telnet and reboot the unit.



Network

IP Mode: Select Static to manually set the IP address using the fields below, or choose DHCP to allow the AR to automatically acquire its network settings from a DHCP server.

IP Address: Enter a static IP address in dotted decimal format. This field will be automatically set if using DHCP.

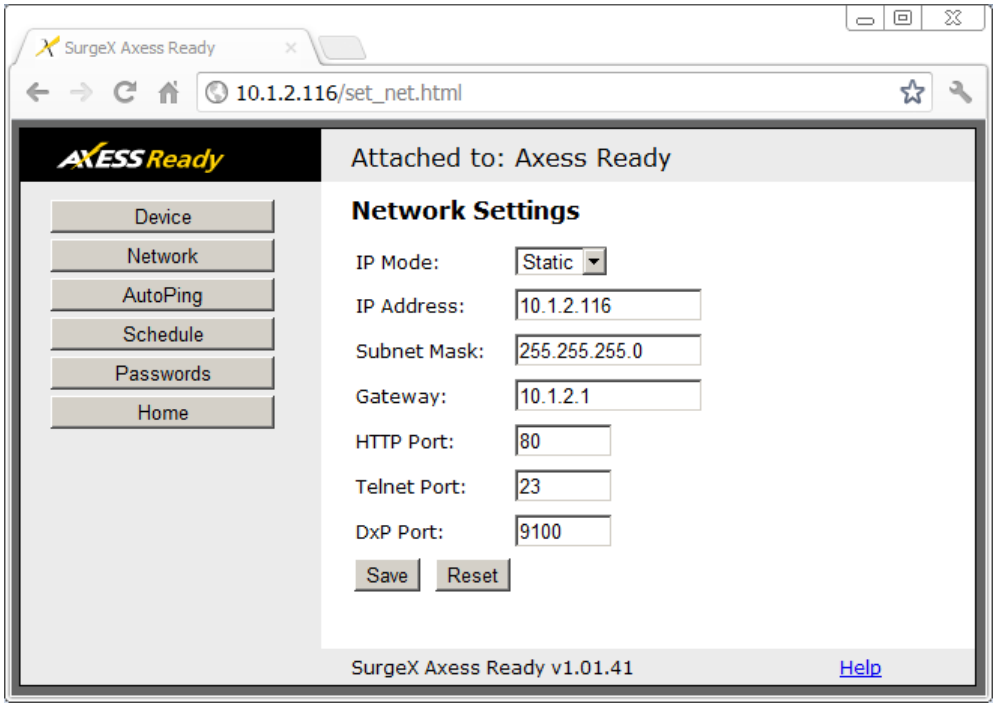
Subnet Mask: Enter the Subnet Mask in dotted decimal format. This field will be automatically set if using DHCP.

Gateway: Enter the Gateway in dotted decimal format. This field will be automatically set if using DHCP.

HTTP Port: Specify the port the web server will be accessed on. If the port is changed from the default value of 80, the AR may be accessed by specifying the new port number in this format: http://IPADDRESS:NEWPORT. Example: Navigate to http://192.168.1.254:8000 for an IP address of 192.168.1.254 on port 8000.

Telnet Port: Specify the port to use for telnet access (default 23).

DxP Port: Specify the port to use for DxP protocol (default 9100).



VI. Web Server (continued)

AutoPing

The AutoPing feature allows the AR to automatically detect failed equipment and perform a timed reboot or other power control function (like turning on an indicator or siren). First specify one or two IP addresses to be periodically pinged. When the AR no longer receives a response from these addresses, the programmed power control function is actuated. AND or OR logic can be applied to the two addresses, so that both (AND) or either (OR) must fail in order to trigger the selected action.

Examples:

Server monitor: AR is installed with the device it monitors and automatically reboots if there is no response. Ideal for Kiosks and Servers.

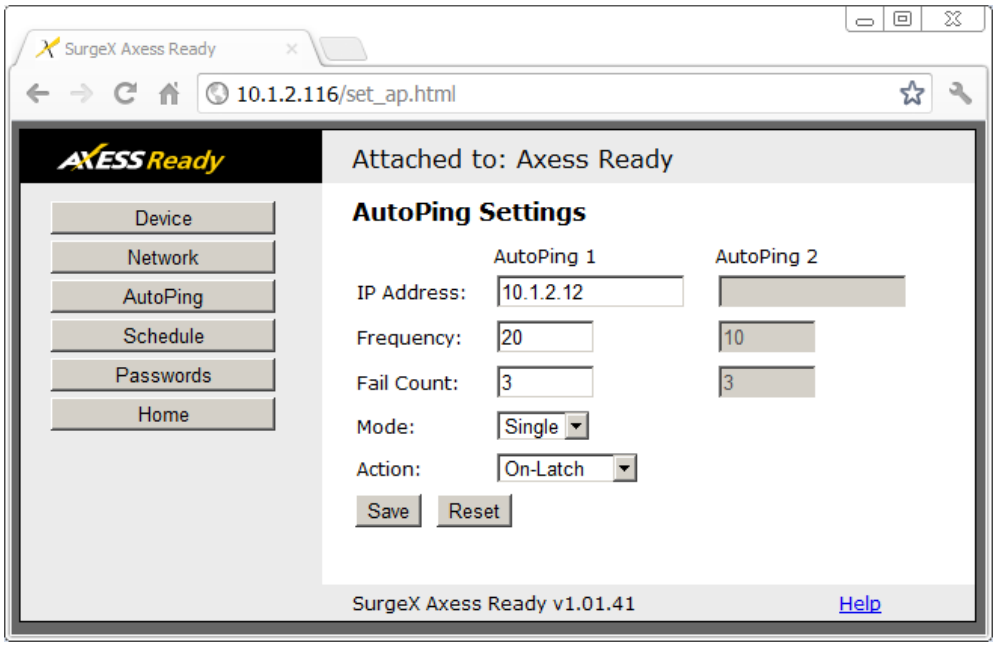
Service monitor: AR is installed with the device to be rebooted, but pings a remote host to test the communication channel. Ideal for DSL/Cable Modem verification.

AR monitors a network device, and powers up an alarm or redundant system when there is no response. Ideal for Hot Standby Servers, Environmental Control, Alert for any network failure.

- IP Address 1 and 2: Enter the IP address(es) of the device(s) to be pinged.
- Frequency 1 and 2: Enter the desired ping frequency in seconds for the device(s) to be pinged (1-999 seconds).
- Fail Count 1 and 2: Enter the number of times the ping must consecutively fail (1-999) before the selected action is triggered.
- Mode: Select the logic to be used (AND, OR, or Single). With AND logic, both AutoPings must exceed their fail count to trigger the action. With OR logic, the action will be triggered if either AutoPing exceeds its fail count. With Single, only AutoPing 1 is used.

- Action: Select the action to be triggered.

None	AutoPing not used
Power On – Latch	Upon triggering, AR will power on and remain so until changed via web, telnet, or DxP.
Power On – Follow	Upon triggering, AR will power on. When the ping response returns, AR will power off.
Power Off – Latch	Upon triggering, AR will power off and remain so until changed via web, telnet, or DxP.
Power Off – Follow	Upon triggering, AR will power off. When the ping response returns, AR will power on.
Power Cycle	Upon triggering, AR will cycle the power. AR will then wait for (Ping Frequency x Fail Count) seconds; if the response does not return, the power will be cycled again. This will repeatedly continue until the ping response returns or AutoPing is turned off. Ensure that the AutoPing frequency is longer than the time required to reboot the device.
Power Cycle - Once	Upon triggering, AR will cycle power one time. It will not cycle again automatically until the ping response returns and is lost again.



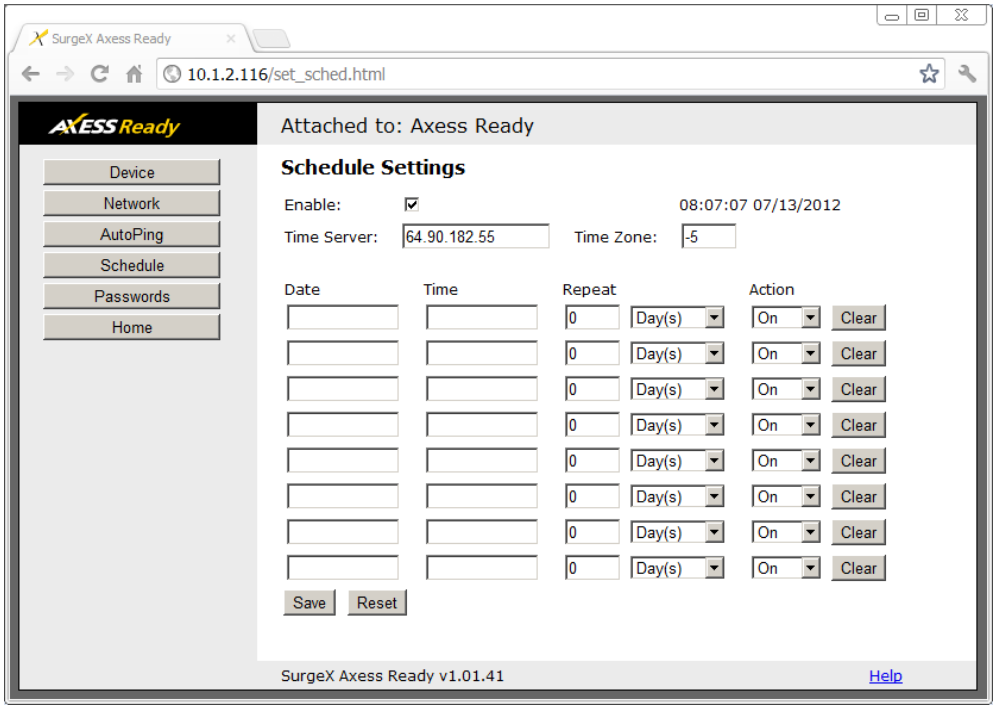
VI. Web Server (continued)

Schedule

The AR can schedule up to 8 recurring power events. For each event, you may define the starting date and time, the action to be taken, and the repetition interval (optional).

Important: A Network Time Server (NTS) must be specified and enabled in order to use the time scheduling feature. A list of public time servers is available at http://www.ntp.org.

- Enable: Checking the Enable box enables the time scheduling feature.
- Time Server: Enter the IP address of the Network Time Server to be used.
- Time Zone: Specifies the local time zone relative to GMT. For example, the setting for EST is -5.
- Date: Set the initial date for the event in mm/dd/yyyy format.
- Time: Set the initial time for the event in hh:mm:ss format. Hours are specified in 24 hour format; for example, 8:05:00 pm would be entered as 20:05:00.
- Repeat (Optional): Set the repetition interval. 0-999 Days, Hours, or Minutes.
- Action: Set the action to be scheduled. On, Off, or Cycle.
- Clear: Deletes a schedule.



Passwords

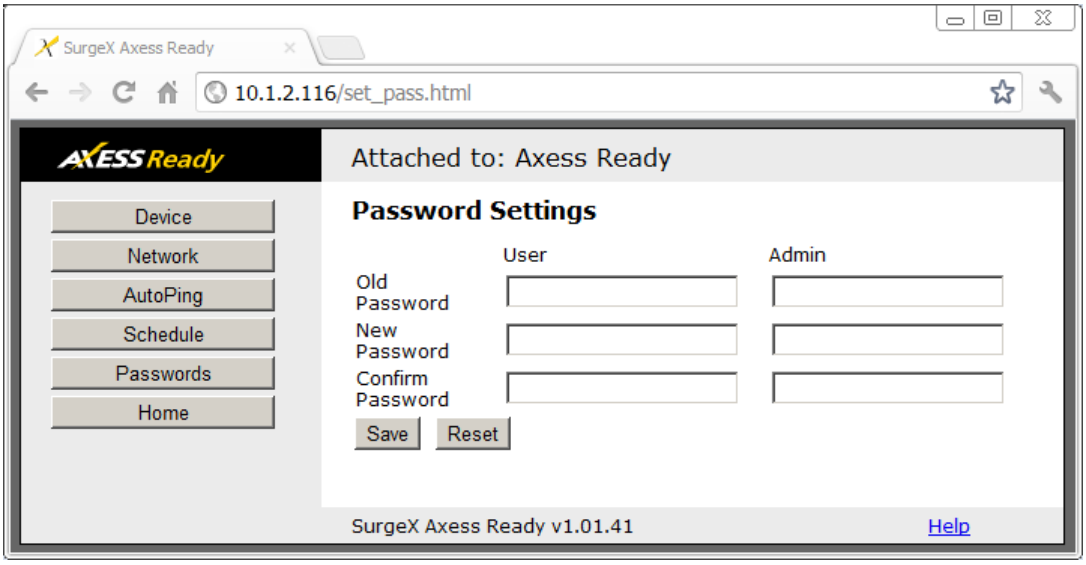
Two passwords are used by the AR. The User password allows control of the AC output state, but provides no access to Setup functions. The Administrator password allows full control and setup of the AR.

Passwords may be up to 20 characters long, and are case sensitive.

- Old Password: Enter the password currently in use.
- New Password: Enter the new password to be used.
- Confirm Password: Enter the new password to be used again.

Default credentials:

Role	Username (fixed)	Password (user set)
Administrator	admin	admin
User	user	user



VII. Command Line Interface (CLI) Protocol

The Command Line Interface provides complete setup of all functions of the AR. The CLI may be accessed through the Telnet protocol, and requires a Telnet client program. Some commands of the CLI require administrative rights; these are indicated in the following tables.

Prompts

Prompt	Description
User>	Prompts the user to enter the user name (either user or admin).
Password>	Prompts the user to enter the password.
Axess Ready>	Prompt displayed while logged in.
Axess Ready Reboot Required>	Prompt displayed after changes have been made that require a reboot. This prompt will remain active until the AR has been rebooted.

Control Commands

Command	Description	Admin	Fact Def
get outlet	Returns the current status of the outlet.	No	
set outlet < on | off | cycle >	Sets the outlet to the selected state.	No	

Device Commands

Command	Description	Admin	Fact Def
get location	Returns the location ID.	Yes	Axess Ready
set location < 20 character max >	Sets the location ID.	Yes	
get cycle	Returns the cycle time currently in use in seconds.	Yes	10
set cycle < 1-999 >	Sets the cycle time in seconds.	Yes	
get upgrade enable	Returns the upgrade enable status.	No	Disabled
set upgrade enable < yes | no >	Enables or disables the ability to upload new firmware.	Yes	
Logout	Terminates the telnet session.	No	
Reboot	Reboots the AR.	Yes	

VII. Command Line Interface (CLI) Protocol (continued)

Network Commands

Command	Description	Admin	Fact Def
get network	Returns all network settings currently in use. Example: Mode: DHCP IP Address: 10.1.2.69 Subnet: 255.255.255.0 Gateway: 10.1.2.1 HTTP Port: 80 Telnet Port: 23 DxP Port: 9100 Timeout: 20 Ok	Yes	
set ipmode < static | dhcp >	Sets the IP address mode. Static mode locks the IP address as set; DHCP mode allows a DHCP server to assign the address.	Yes	Static
set ipaddress < dotted decimal >	Sets the IP address.	Yes	192.168.1.254
set subnet < dotted decimal >	Sets the Subnet Mask.	Yes	255.255.255.0
set gateway < dotted decimal >	Sets the Gateway address.	Yes	192.168.1.1
set http port < 0-65535 >	Sets the port that the internal Web server listens for incoming connections on. When set to 0 the web server is disabled. May not be disabled when Telnet and DxP are both disabled.	Yes	80
set telnet port < 0-65535 >	Sets the port that the internal Telnet server listens for incoming connections on. When set to 0 the Telnet server is disabled. May not be disabled when Web and DxP are both disabled.	Yes	23
set dxp port < 0-65535 >	Sets the port that the internal DxP service listens for incoming connections on. When set to 0 the DxP service is disabled. May not be disabled when Web and Telnet are both disabled.	Yes	9100
set timeout < 0-999 >	Sets the automatic network timeout in minutes.	Yes	2

VII. Command Line Interface (CLI) Protocol (continued)

AutoPing Commands

Command	Description	Admin	Fact Def
get autoping	Returns all AutoPing settings currently in use. Example: AutoPing 1 AutoPing 2 IP Address: 10.1.2.36 0.0.0.0 Frequency: 60 10 Fail Count: 3 3 Status: OK OK Trigger Count: 0 0 --- Mode: Single Action: On-Latch Ok	Yes	
set autoping < 1 | 2 > ipaddress < dotted decimal >	Sets the IP address to be pinged for AutoPing 1 or 2.	Yes	0.0.0.0
set autoping < 1 | 2 > frequency < 1-999 >	Sets the frequency (how often the ping is sent) for AutoPing 1 or 2 in seconds.	Yes	10
set autoping < 1 | 2 > failcount < 1-999 >	Sets the number of consecutive failures the AutoPings must detect before the AutoPing considers the pinged device to be failed.	Yes	3
set autoping mode < single | and | or >	Sets single AutoPing (AutoPing 1) or two AutoPing relationship AND or OR.	Yes	AND
set autoping action < none | on-latch | on-follow | off-latch | off-follow | cycle | cycle-once >	Sets the action to be performed when the AutoPing is triggered.	Yes	None

User Commands

Command	Description	Admin	Fact Def
set password < user | admin > < old > < new > < repeat >	Sets the password of the User or Administrator.	Yes	user | admin

VII. Command Line Interface (CLI) Protocol (continued)

Event Commands

Command	Description	Admin	Fact Def
get events	Returns all scheduled events currently in use. Example: Date Time Repeats Action 1. 12/22/2011 14:00 every 2 Hour(s) Cycle 2. every 0 Day(s) On 3. every 0 Day(s) On 4. every 0 Day(s) On 5. every 0 Day(s) On 6. every 0 Day(s) On 7. every 0 Day(s) On 8. every 0 Day(s) On Ok	No	
get time	Returns the current time and time server. Example: Current Time: 10:14:17 12/20/2011 Server: 10.1.2.12 Ok	No	
set time server < dotted decimal >	Sets the IP address of a Network Time Server.	Yes	64.90.182.55
set time enable < yes | no >	Enables or disables the use of a time server and scheduled events.	Yes	No
set event < 1-8 > date < mm/dd/yyyy >	Sets the scheduled event's starting date.	Yes	
set event < 1-8 > time < hh:mm:ss >	Sets the time the scheduled event will occur in 24 hour format.	Yes	
set event < 1-8 > repeat < day | hour | minute >	Sets the repetition interval type for the selected event.	Yes	
set event < 1-8 > mult < 0-999 >	Sets the number of repetition intervals for the selected event. For example, 20 days, 30 minutes, 24 hours, etc.	Yes	
set event < 1-8 > action < on | off | cycle >	Sets the action to be performed at the scheduled time.	Yes	
del event < 1-8 >	Deletes the scheduled event.	Yes	

VIII. DxP Protocol

Overview

The DxP Protocol is a packet-based protocol designed to be extensible. This protocol is transmitted over TCP on a user-defined port. The factory default DxP port is 9100.

The protocol uses a Hello handshake to establish unique sequence numbers to allow for advanced security when AES encryption is used. With AES enabled, all messages must be encrypted with the AES Passphrase set in the device.

After the Hello, a Command and Response sequence follows. Any number of Command → Response sequences are permitted after Hello.

Hello Handshake

The client sends a Hello message in the form of a text string 'hello-000'. The DxP enabled device will respond with a packet containing the unsigned 16 bit sequence number. This sequence number is incremented by the client and server with each correct packet sent.

Example:

Client		Server
hello-000	→	
	←	1234 (seq 1234)
Command (seq 1235)	→	
	←	Response
Command (seq 1237)	→	
	←	Response

DxP Packet

The packet is broken up into 2 parts: the Header and the Payload.

Header

The header is used to carry general information, such as is shown in the C programming structure below:

```
typedef struct {
    eCmnd command;
    char[21] uName;
    char[21] password;
    uChar desc;
    uChar param;
    uint16 seq;
} THeader
```

Variable	Description
command	Enumerated type that tells the DxP server what class of command is being sent. See the Commands subsection for a full list of command classes.
uName	Reserved for future use. It will contain the user name of a user on the ipIO that is being accessed.
password	Reserved for future use. It will contain the password of the user above.
desc	Command descriptor that describes the individual command within a command class. By extension it lets the server know what the payload is. There is a different set of descriptors for each command class; see the Descriptors subsection for a full list of descriptors by command class.
param	Reserved for future use. Optional parameter that may be passed to the server in addition to the descriptor.
seq	The packet's sequence number. Used as part of the security scheme.

Payload

The payload is determined by a combination of the command class and the descriptor. The payloads are described with the descriptor; see the Descriptors subsection for details.

Commands

There are currently 7 command classes. All classes are defined in the C programming enumerated type definition below:

```
typedef enum {
        eCmnd_null,
        eCmnd_set,
        eCmnd_get,
        eCmnd_io,
        eCmnd_keepAlive,
        eCmnd_rss,
        eCmnd_rcu
} eCmnd;
```

	Command	Description
0	eCmnd_null	This is a null command and should not be sent to the server.
1	eCmnd_set	This command is used to set programmable variables on the server.
2	eCmnd_get	This command is used to get programmable variables from the server.
3	eCmnd_io	This command is used to monitor and control the I/O on the server.
4	eCmnd_keepAlive	This command is sent to the server as a means of allowing the client to validate the communications path to the server.
5	eCmnd_rss	This command class is used to control the RSS nest using the RCU. **Note: Project specific command. Not for general use.**
6	eCmnd_rcu	This command class is used to update the display of the RCU. **Note: Project specific command. Not for general use.**

Descriptors

Descriptors are used to describe the individual command within a command class, and the payload that the packet contains. All of the descriptors and their payloads are outlined by command class below.

eCmnd_set
The descriptors for this command class will be product specific.

eCmnd_get
The descriptors for this command class will be product specific.

eCmnd_io

```
typedef enum{
    eIO_null,
    eIO_changeRelay,
    eIO_changeRelays,
    eIO_getRelay,
    eIO_getRelays,
    eIO_getInput,
    eIO_getInputs,
    eIO_pulseRelay,
} eIO;
```

Command	Description	Server Response
eIO_changeRelay	This command is used to change the status of an individual relay. It carries the TChangeRelay payload; see the Payloads subsection for details.	0 → Successful 1 → Error
eIO_changeRelays	This command is used to set all of the relays in a device. It carries the TChangeRelays payload; see the Payloads subsection for details.	0 → Successful 1 → Error
eIO_getRelay	This command has not yet been implemented.	
eIO_getRelays	This command is used to get the status of all the relays on the server.	Byte Array containing status of each relay.
eIO_getInput	This command has not yet been implemented.	
eIO_getInputs	This command is used to get the status of all inputs on the server.	Byte Array containing status of each input.
eIO_pulseRelay	This command is used to pulse a relay. It carries the TPulseRelay payload; see the Payloads subsection for details.	0 → Successful 1 → Error

eCmnd_keepAlive

```
typedef enum{
    eKeepAlive_null;
} eKeepAlive;
```

Command	Description	Server Response
eKeepAlive_null	This is the only valid descriptor that the keep alive command supports. It is defined as null, as it carries no payload.	0 → Successful 1 → Error

Payloads

TChangeRelay

```
typedef struct{
        unsigned char relay;
        unsigned char state;
} TChangeRelay;
```

Where relay is the number of the relay to be affected – 1 (For example, 0 for relay 1 and 1 for relay 2) and state sets the state of the relay (1=Energize; 2=Relax).

TChangeRelays

```
typedef struct{
        unsigned char relayStates[32];
}TChangeRelays;
```

Where relayStates is an array of relay states as defined below:

```
#define NO_CHANGE  0
#define ENERGIZE       1
#define RELAX          2
```

This payload is supported by devices that support the DxP protocol with 2-32 controllable relays.

TPulseRelay

```
typedef struct{
        unsigned char relay;   //the relay to be pulsed
        unsigned char state;   //the state to pulse
        uint16 pulseWidth;     //the pulse width in seconds
}TPulseRelay;
```

Where relay is the number of the relay to be affected, state is the state to pulse, and pulseWidth is the time to pulse in seconds.

X. Firmware Upgrades

The AR can be upgraded via the network if the upgrade feature has been enabled. To perform a field upgrade, follow the steps below.

Important: Upgrading the firmware with a minor upgrade (For example, 1.01.xx to 1.01.yy) will not alter the user defined settings. Major upgrades may or may not reset the AR to factory defaults. Check the release notes for the upgrade before making any changes.

1. Download the latest firmware version and Device Management Utility (DMU) from the SurgeX website: http://www.surgex.com.

2. Enable the upgrade feature. Use the CLI **set upgrade enable yes** command via telnet, or check the "Upgrade Enable" box on the Device web page.

3. Run the DMU. If the AR you would like to upgrade is not visible in the list box, either:

   - Select Device | Discover from the menu to locate the ARs on the local network.
   - Select Device | Add from the menu to manually add the AR by IP address.

   Once the device is displayed in the list, highlight it.

4. Select Manage | Upgrade Firmware.

   Enter User Name admin and the password for the Administrator.

   Enter the filename of the new firmware, or click Browse and navigate to the firmware file to be used. AR firmware files use the file extension **.g2u**. If no files of that type are displayed, ensure that the "Files of Type" box is set for SX-iPD or All Files.

   Click OK when all details are entered.

5. The upload will begin, and a progress bar will be displayed.

6. When the firmware upload is complete, the AR will automatically reboot and will be ready for use.

XI. Reset Button

The recessed reset pushbutton located on the right side next to the Axess On LED performs 3 functions as detailed below:

Action	Result
Momentary	Soft Reset. Will not affect outlet state.
5 Second Push	Reset to Factory Defaults. Hold until the "System On" LED is blinking, then release.
Hold while powering up	Recovery Mode. Allows upload of new firmware to Factory Default IP address of 192.168.1.254.

XI. Specifications

Physical				
Model	Width	Depth	Height	Weight
SX-20NE-RT-AR	12.0”	4.0”	12.0”	14 lb.
Temperature	5 - 35° C			
Humidity Range	5% to 95% R.H., non-condensing			

AC		
Load Rating		20 Amps @ 120 Volts (2400W)
Power Requirement (no load)		20 Watts
UL 1449 Adjunct Classification Test Results		1000 surges, 6000 Volts, 3000 Amps,B3 pulse, measured suppressed voltage 170 Volts, no failures
Maximum Applied Surge Pulse Joule Rating		Unlimited, due to current limiting (8 x 20 µs)
Maximum Applied Surge Pulse Voltage		6000 volts (1.2 x 50 µs pulse),industry standard rating
Maximum Applied Surge Pulse Current		Unlimited, due to current limiting (8 x 20 µs)*
Endurance		IEEE C62.41-1991 Category B3 (C1)
Pulses		1 kV>500,000; 3 kV>10,000; 6 kV>1000
Maximum Load Inrush Energy		1000 Joules total during power-up
EMI/RFI Filter	Normal Mode (50 Ω load)	40 dB@100 kHz;50 dB@300 kHz;50 dB@3 MHz;50 dB@30 MHz
	Common Mode (50 Ω load)	18 dB@300 kHz; 30 dB@1 MHz;50 dB@5 MHz; 50 dB@20 MHz

Remote Connections	
Remote Control Voltage	5 – 30VDC
Remote Control Current Draw	5mA maximum
Contact Closure Max. Resistance	100 Ω
Auxiliary Relay Contact Rating	30VDC @ 1A
12V Output Max. Current	20mA

Network
Single 10/100 Unshielded Twisted Pair Ethernet Jack
IP Addressed: DHCP Assigned or Static
Internal HTTP Web Server
Forms Processing Browser Required
Internal Telnet Server

Compliance	
UL/cUL	UL60950 Listed I.T.E. File No. E225914 UL 1449 3rd Edition In Progress
CE	Directives 89/336/EEC, 92/31/EEC and 93/68/EEC EN 60950: 3rd Edition EN55022: 1998 Class B
FCC	Part 15 Class B

*1.2 x 50 µs pulse, industry standard combination wave surge, as per IEEE C62.41